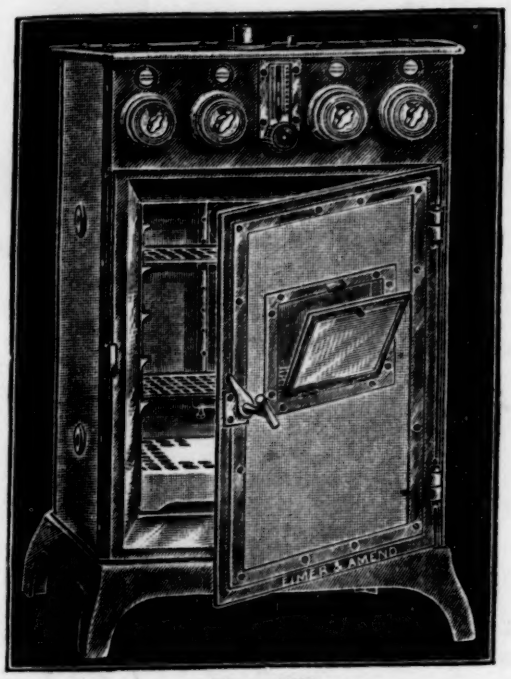
FEB 19 1917
UNIV. OF MICH.
LIBRARY

SCIENCE

NEW SERIES
VOL. XLV. No. 1155

FRIDAY, FEBRUARY 16, 1917

SINGLE COPIES, 15 CTS.
ANNUAL SUBSCRIPTION, $5.00



Type HT

There is a Freas Electric Oven to meet *your* particular constant temperature requirements

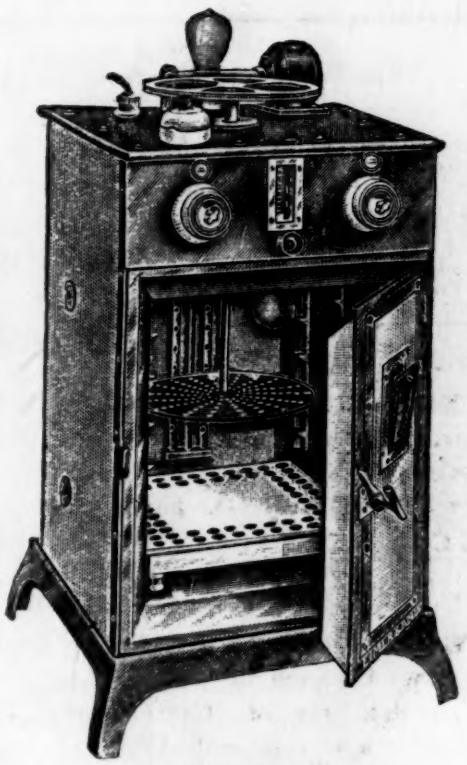
Ovens Type R for temperatures up to 180° C. and Type HT for temperatures up to 260° C. are the standards for general drying purposes at accurate constant temperature.

Type RS is provided with revolving shelf which subjects the samples to exactly the same conditions. This arrangement is according to Mr. Roy O. Fitch of the Bureau of Standards, Washington.

The ovens illustrated on this page and other types for air drying, also ovens for drying in vacuum at accurate constant temperature, are described in our new booklet

"Freas Electric Ovens"

Write for a copy



Type RS

EIMER & AMEND

FOUNDED, 1851

New York City Pittsburgh, Pa. Ottawa, Canada

Two Practical High School Books

Weed's Chemistry in the home gives practical information concerning the chemistry of everyday things related to the industries and the home.

Clark's Introduction to Science covers a broader field, embracing not merely chemistry and foods, but physiology, hygiene, physics, botany, biology, physiography, and geology.

Both are distinctly utilitarian in character and particularly suited to students who are not preparing for college.

American Book Company

New York Cincinnati Chicago

Ease in Reference

is insured through the use of

Wentworth-Smith Trigonometric and Logarithmic Tables . . 60 cents
For students of trigonometry.

Barker's Computing Tables and Mathematical Formulas. 60 cents
For mathematics teachers, students, professional computers and engineers.

Longley's Tables and Formulas, Revised Edition . . . . . **50 cents**
For solving numerical problems in analytic geometry, calculus, and applied mathematics.

Moore's Logarithmic Reduction Tables $1.00
For students of mathematical chemistry.

Detailed descriptions on application

GINN AND COMPANY

Boston New York Chicago London
Atlanta Dallas Columbus San Francisco

Wanted by the Book Shop, Woods Hole, Mass.

American Naturalist, first ten volumes.
Zoological Record, singly or in runs, Vols. 1–37, 31 to date.
Bibliographia Physiologica, Vols. 1-4, and B. Zoologica 1-14.
Complete Sets of Zoologisches Zentralblatt, Anatomische Hefte, Journal of Anatomy and Physiol., (British)
Lists of Scientific Books, Journals or Separates to be sold or exchanged.

ELIZABETH H. DUNN, Woods Hole, Mass.

OPTIC PROJECTION

Principles, installation and use of the Magic Lantern, Opaque Lantern, Projection Microscope and Moving Picture Machine; 700 pages, 400 figs. By SIMON HENRY GAGE, B.S., and HENRY PHELPS GAGE, PH.D. Postpaid, $3.00.

THE COMSTOCK PUBLISHING CO., Ithaca, N. Y.

The Ellen Richards Research Prize

The Naples Table Association for Promoting Laboratory Research by Women announces the offer of a research prize of $1000.00 for the best thesis written by a woman embodying new observations and new conclusions based on independent laboratory research in Biology (including Psychology), Chemistry or Physics. Theses offered in competition must be in the hands of Chairman of the Committee on the Prize before February 25, 1917. Application blanks may be obtained from the secretary, **Mrs. Ada Wing Mead, 283 Wayland Avenue, Providence, R. I.**

THE PRINCIPLES OF STRATIGRAPHY

BY

AMADEUS W. GRABAU, S.M., S.D.

PROFESSOR OF PALEONTOLOGY IN COLUMBIA UNIVERSITY

"Should be on the reference shelf of every college, normal school, and large high school in the United States."—*Journal of Geography*, Vol. XIII, Jan. 1915.

8vo, 1150 pages, 264 illustrations. Price, $7.50

Descriptive Circular Sent upon Request

A. G. SEILER & CO.

NEW YORK CITY

SCIENCE

FRIDAY, FEBRUARY 16, 1917

CONTENTS

The American Association for the Advancement of Science:—

The Outlook for Agricultural Science: PROFESSOR EUGENE DAVENPORT 149

Scientific Events:—

Sigma Xi in Duluth, Minn.: DR. EUGENE VAN CLEEF. *The Hancock Mineral Collection:* PROFESSOR JOHN E. WOLFF. *The American Academy of Public Health* 160

Scientific Notes and News 162

University and Educational News 164

Discussion and Correspondence:—

The Slides of the Panama Canal: DR. BENJ. L. MILLER 164

Scientific Books:—

Lahee's Field Geology: PROFESSOR HERDMAN F. CLELAND. *Shäfer on the Endocrine Organs:* DR. P. G. STILES 166

Race Hygiene in Norway: CHANCELLOR DAVID STARR JORDAN 167

A Census of the Periodical Literature of Chemistry published in the United States: MARION E. SPARKS AND PROFESSOR W. A. NOYES ... 168

The American Society of Naturalists: PROFESSOR BRADLEY M. DAVIS 171

MSS. intended for publication and books, etc., intended for review should be sent to Professor J. McKeen Cattell, Garrison-on-Hudson, N. Y.

THE OUTLOOK FOR AGRICULTURAL SCIENCE[1]

WITHOUT wasting time in discussing the question whether there is such a thing as agricultural science, I desire to proceed at once to a brief review of the conditions both favorable and unfavorable to the progress of those scientific activities necessary to the improvement of American agriculture and the welfare of country people upon whom we all depend for our food supply, for the proper employment and treatment of our lands, and for certain human qualities best propagated and preserved in the life of the open country.

THE PLAN

No thinking man can fail to be deeply impressed with the magnitude and the far-reaching consequences of what might be called the American program for agricultural advancement.

This program took definite form in 1862 in the establishment of a national Department of Agriculture, and in the passage of the Land Grant Act, whereby a college of agriculture was established in every state of the union. It was characterized and vitalized a quarter of a century later by subsequent acts providing for an experiment station in connection with every agricultural college; and mightily advanced by state appropriations, in some instances multiplying many times the federal subsidy. So generous indeed were these appropriations that the $30,000 of federal funds

[1] Address of the vice-president and chairman of Section M, Agriculture, American Association for the Advancement of Science, New York, December 27, 1916.

have been supplemented until the total revenues of certain institutions for agricultural research amount to no less than $200,000 annually.

This combined federal and state program aims directly at an adequate and a permanent food-supply, and with equal directness it proposes to retain upon the land, if possible, a fair share of the intelligence, the learning, and the culture of the American people. This latter purpose may be called Utopian, but a little reflection will convince even the most skeptical that in no other way can our lands be properly handled, for farming is after all and in the last analysis an individual affair.

The incidental effect upon citizenship of such a systematic effort, especially in a democracy, is an interesting sociological and economic question, but it is quite aside from the present purpose, which is to analyze the agencies that have been awakened in the name of agricultural science and to distinguish as clearly as possible between those that are really helpful and others that by accident or otherwise have become attached like barnacles to the ship and whose load is even less serious than their resistance.

The sudden establishment of a national system of fifty institutions under combined federal and state support, and the engaging upon this extensive scale in both education and research in a hitherto neglected, if not despised, field was certain to be followed by results both desirable and undesirable. The combination is still further complicated by the fact that the new field has suddenly become popular, drawing into its vortex amounts of money never before equaled, and engaging the attention of all sorts and conditions of men, some seeking opportunity for real service, others attracted by the loaves and fishes, even by the crumbs.

It was as inevitable that certain results should follow the agencies here invoked as that other effects should follow causes.

For example, it is impossible to launch so pretentious a program without a vast amount of good resulting, and in this respect the most sanguine enthusiasts have not been disappointed. It is impossible to accomplish a public service of this character and magnitude without developing a body of earnest, capable and devoted scientists who work, not for reward, but for the good that they can do, and it is my desire here and now to pay tribute of respect to the hundreds, yes thousands of men and women who labor both day and night, who expose and often destroy their health in carrying forward this great work. They shall have their reward.

But it is also impossible to suddenly engage upon an extensive scale in a new and undeveloped field without drawing into the service both inadequately trained and mediocre men. It is impossible that a field should be popular without attracting the sensationally minded, and it is equally unlikely that so large an amount of public money could be expended without the creation of a vast and complicated administrative machinery.

It is for us who have been in this work almost from its beginning and who have seen with our own eyes both the wheat and the tares developing side by side to critically and somewhat sharply distinguish between the two. Not only should we do this among ourselves, but, difficult and unpleasant as the service is, we owe it to the public, we owe it to our institutions, and we owe it to ourselves to frankly state the conditions as they are, with a view to the correction of certain evils that have crept in and which, if not exterminated, will destroy not only the best work in agricultural science, but even the institutions that were founded and are operated for its advancement.

THE FIELD

It can not be too thoroughly and universally understood and remembered that for the purpose of research, teaching and demonstration, agriculture means farming. Agriculture is so broad a term; it touches so many sciences and at so many points; its problems are so varied and the questions involved in their solution are so fascinating that the temptation to wander far afield is often well nigh irresistible.

However, the funds appropriated, whether public or private, were set aside for the express purpose of improving the quantity, quality, reliability and permanency of our food supply and for the welfare of those who work the land and who, experience shows, rapidly descend to the level of peasantry under conditions which they are unable to control without the assistance of science, the benefits of education, and the support of the public conscience.

Wherefore, we are to distinguish sharply between those lines of investigation that bear upon the business of farming and those collateral lines which, though they may arise out of the materials of agriculture, have yet little or no significance in the field of food production.

In saying this the writer is not to be understood as restricting the field to so-called practical lines. Far from it. For this purpose at least there is no distinction between what is practical and what is scientific. But let the scientist be not deceived by the materials with which he works. It is not the materials that determine whether a piece of work is truly agricultural; it is the outlook, the purpose, the application that is to be made, these are the tests, not as to the excellence of the work or its general significance, but as to its legitimacy, especially in the experiment stations.

Wherefore, these funds are not available for ordinary scientific research, however valuable, even though the materials involved be drawn from the farm. They are not available for the amusement or the personal enjoyment of the investigator; neither are they to be devoted to paying the expenses of aviation excursions into the rarefied and upper atmosphere of speculation even in so worthy a field as the so-called pure sciences.

The temptation to wander afield is not only due to the fascination of outlying pastures, but it is strengthened by the actual and frequent necessity of spending much time and energy in clearing up an abstract point which science in its imperfect state has not yet touched. But these excursions into outlying territories after truth necessary for purposes of further research are to be regarded as essential rather than logical; as a means to an end and never a purpose. At no point does the research man in agriculture need to step permanently aside for facts which science has not yet supplied, but which he must obtain before going ahead with his proper work.

MEN

Fortunately for some reasons, unfortunately for others, the time has come when agriculture is popular. Among the fortunate features of so happy a condition of affairs is the fact that we now command in this field the respect and the service of the highest grade of men with the best obtainable training. And if some are yet tempted to enter this form of service in the hope of premature, if not undue publicity, we have the satisfaction of believing that their numbers are growing relatively smaller.

Indeed, as matters stand to-day it would be difficult to find in any other branch of human activity a more self-sacrificing and public-spirited class of men than are those of our agricultural colleges and experiment stations. They have had some trouble, it is

true, in obtaining in all cases suitable training, but their spirit and energy are certainly laudable, even calling often for restraint in the interest of health and the higher service.

A heavy weight of responsibility rests upon the young man now preparing for a career in agricultural research. It is not enough that he have some special knowledge and skill in a narrow field such as soil analysis, genetics or vegetable pathology. He must have scholarship, breadth of knowledge and vision enough to know the relation of his specialty to other branches of science, and the bearing of it all upon the business and the practise of food production, that is, farming.

For the purposes of the investigator a real knowledge of and sympathy with the actual operation of the farm and the problems of the farmer is not only desirable, but essential. Farming is a productive, not a speculative industry, and the problems of agriculture are those of production and distribution, not those of special opportunity.

Moreover, farming is a private business upon which the welfare of families depends —not a few scattered people, but a full third at least of all the population and constituting entire communities. This fraction of the race must not be disregarded or the earth will avenge herself not only upon the unsuccessful farmer, but upon the people as a whole, whose heritage, after all, the land is.

The agricultural scientist, therefore, must not make mistakes, or he will lead a whole people to disaster. Our philosophies may be wrong; they can be readjusted. Our conceptions of the solar system may be incomplete or wholly erroneous; but everyday life will go on about the same. However, if we entertain wrong conceptions about the serious business of food production, the consequences are swift and merciless.

If we get too little out of the earth, population is unduly restricted or unutterably miserable; and if we win our sustenance by methods destructive rather than permanent, then our successors, if not we ourselves, will pay the penalty of our error or of our piracy. Science is our only reliance, but the agricultural engineer must make no mistakes. He must be no blind leader of the blind. Therefore he must know the business of farming.

Now this is easier said than realized. The college student has lived all his life in school. Learning has been his occupation. Moreover, we shall tell him that if he expects to be really valuable, he must not stop with the bachelor's degree, but he must do so much in addition and do it so well that he will inevitably and in good time achieve the doctorate.

How then can this young man know by experience the business of farming? He can not know it as the farmer knows it after fifty years of earning a living and of clothing and educating the family he has raised. This prospective scientist will work for a salary, which means an assured living while he studies and attempts to solve the problems of those who live by production.

The problem for the young scientist is not easy, and that is the reason for discussing it at length. It takes twelve years of child life to finish the high school and prepare for college. The student is twenty to twenty-two at graduation. Three years more for a doctorate puts him at twenty-three to twenty-five. Besides, there is marriage to be considered, for farming is a married man's job, and bachelors as a class will never solve its problems. When and how is this man to get experience in actual farming?

Experience in supporting a family on

the farm he can not have unless he owns a farm and becomes a real farmer, in which case he is out of our reckoning, for observation shows that such men are not likely to return to the public service except after failure, when they are not desirable.

It is impracticable, in the opinion of the writer, to require farm experience as a condition either of admission to college or of graduation, largely because of the difficulty of ascertaining and certifying what constitutes satisfactory experience; but it is possible to require actual farm experience as a prerequisite to certain elective courses of instruction, leaving the teacher to determine sufficiently for his purpose a question that has no complete solution.

It has long been the custom of the writer to advise every student in agriculture who has not lived a full year in actual work upon a real farm to drop out in the middle of the sophomore year and get it. This particular time is recommended as affording enough scholarship to enable him to look at the matter from the student's point of view, as being less valuable than later years, involving less embarrassment to the student, and as calculated to greatly enrich the later years of study. This is recommended for all students of agriculture, whether headed for farming or for a scientific career; and without at least this much of actual touch with real rather than paper farming, the future usefulness of the experiment station man is far from assured.

Much space is devoted to this subject because it looms large in public affairs just now. In conversation the other day with the most prominent Hindoo philosopher now living, and whose son graduated in the agricultural college of the institution I represent, this extensive landholder complained of the lack of practical knowledge or even of appreciation of the conditions actually and necessarily confronting the Indian farmer on the part of men in the public service and presumably qualified to advise and assist the people with an improved solution of their very difficult problem. They know certain scientific facts as abstractions, but to be useful somebody must make the application to practise and this application should be made by educated men.

No conception needs to be more firmly impressed upon the young agricultural scientist at this juncture than the fact that agricultural research is not a game for the amusement of the players, but a real search after truth to be employed in the solution of one of the profoundest of human problems, whether regarded from the standpoint of the individual farmer on his farm, or of public service to a people at large—consumer and producer alike.

VERIFICATION

One encouraging feature of the problem is the fact that the findings of scientists are to have abundant and able verification or correction in the field.

The thousands of farmers who are reading the bulletins of the experiment stations, the hundreds of agricultural students going from our fifty colleges and a growing number of schools back to the farm are all putting to the test, and intelligently too, under a vast variety of conditions, the tentative findings of the specialist. Here lie both safety and inspiration, but the obligation of the scientist to be always and everlastingly right is not lessened.

The business of verification is still further extended and intensified by the system of local improvement associations or farm bureaus, each employing an adviser who, when competent, as he commonly is and as he always ought to be, forms a nucleus for really effective service in actually putting to the working test whatever is new or promising in the business of farming. Fortunately the relations be-

tween the system of advisers and the experiment stations and the colleges of agriculture are very intimate. It looks as though in them the machinery at least for improved and reliable food production is fairly well assured.

POLICE WORK

However, there are always perils in the most promising journeys into unexplored territory or in sailings upon uncharted waters.

The experiment stations are new, and fortunately whatever else may be said they have now the confidence of the farmers, who have come generally to feel that a new force is in affairs and that a new help to farming has appeared in that indefinite thing we call service.

Now there is always a temptation to put sacred things to ungodly uses, and the experiment stations have not escaped the operation of the general law. Science has shown that a certain disease or pest can be controlled, and it has pointed out the method of doing it. What more natural than that the public should take the stations at their word, and say "Very well, here is an appropriation; go ahead, make your serums and your rules to put the thing into practise; hale citizens into court; fine or imprison them if necessary, but make it work"?

Now this is hasty logic and bad practise. The experiment stations are organized for research, not for administration. Again, it is unseemly that a creature of the public like a scientific institution should appear against citizens in the courts and fine or commit them to jail. Besides, the experiment stations have no militia with which to suppress resistance, which in such cases as foot and mouth disease is as ever present as time and as explosive as a volcano.

Besides, the object of the scientist is research, and how shall the experiment station carry on further investigation after new truth if it must stop short and enforce the accumulating mass of revised practise. It will soon be so cluttered up under such a policy that new work is impossible and most of its funds and laboratory space will be used for the purpose of "regulatory work," when further progress is practically impossible, a condition that has already overtaken certain of the experiment stations and is all too rapidly threatening others.

The only safety either to the research worker, the station or the public is for the investigator to verify his discoveries, point out the method of their practical use, and go on after other truths, leaving the public to make such use of the new knowledge as it deems wise and relying upon the usual police power of the state for its enforcement, if enforcement is necessary. In no other way can research be protected; in no other way can the stations discharge the public service for which they were organized; and in no other way can the confidence of the public be indefinitely enjoyed.

THE CULT OF ADMINISTRATION

The rate and the intensity with which administration under one pretext or another is coming to dominate research in this country, especially along agricultural lines, is little short of appalling to any candid observer who takes stock of the situation and who has the courage of his convictions.

Many if not most investigators in agriculture are now required to begin a piece of research work by drafting a formal project in which the materials and methods are definitely described, the cost specified, and the expected results foretold. The method is akin to a new turn of a kaleidoscope, or the setting of a new combination on a complicated machine which, after all the new adjustments of pins, screws and levers have been carefully made, is expected to go

ahead of itself and grind out what might be called inevitable results.

This process is intended as a standardizing procedure, and if results are not soon forthcoming, reports of progress are due from time to time as a kind of perpetual guarantee, on the installment plan, that the thing was worth doing and that the specialist is still "on the job" and not loafing or skylarking off into the wilderness fishing and hunting as scientists are prone to do!

Before anything can actually be done, however, this project, in many branches of the public service at least, must be submitted to administrative review, in order to learn whether the work, however valuable, can be legally performed. I confess to extreme difficulty in treating this portion of my theme with such moderation of language and statement as are appropriate to the dignity of the occasion, and when I fail let the exigency of a just cause be my excuse.

A mass of hirelings called clerks now pounce upon the project, one after the other, each intent, not upon helping forward a valuable piece of public service, but upon seeing if perchance he can not find some statute law, court decision or office ruling that makes the thing illegal and therefore impossible.

In this enterprise the hireling will take no chances. He is not there to promote the public service, but to regulate it, and to see that everything is done decently and in order. If service is prevented altogether, that is no business of his. Everybody must justify his job, and the more things get stopped the more importance is attached to restrictive methods. If everything goes through, many clerkships would be abolished.

Nor should this hireling be condemned when he reports adversely upon a perfectly good thing because it perchance runs counter to the ruling of a public official, even though made many years before in another department under conditions quite dissimilar and by a man of questionable ability, long since dead and practically, if not entirely, forgotten. This clerk was put there to find objections, and it is little wonder that he discovers among the accumulation of laws, decisions and rulings reason enough for stopping many of the things that come his way. After this arbitrary fashion is progress made unduly difficult.

When this project returns to the specialist, battered and beaten, he sets about to reconstruct the plan, using so much of the original as may have passed the various censors, introducing new material to fill the gaps, and sends it out again to run the gauntlet. After repeated journeys and final approval, the real worker at last sets about the task of endeavoring to accomplish something.

But the troubles of the investigator have only begun when the project is finally approved. He needs some new and special equipment and makes out a requisition in quintuplicate and three colors, praying His Majesty the Purchasing Agent to provide the materials for his work—of course out of funds already set aside for his department.

At the best, he must satisfy the business office that no other equipment will answer his purpose and that no other can be bought so cheaply. At the worst he may find that his specifications have partially or entirely been ignored and material ordered which he can not use, and often, through unfamiliarity of "the office" with the tricks of the trade, he is actually mulcted in the purchase.

But this poor project is not through with its troubles. The would-be investigator learns that the purchasing agent is not, after all, a free moral agent, but is himself an hireling. He learns that even the board of trustees, which was elected by the people to operate the university, are not free to use

their judgment, but have certain overlords at the state capitol in the form of special commissions appointed by the governor, and represented mostly by clerks empowered by law to ride rough shod over all conditions.

He finds—this scientist and would-be public servant—that his requisition for equipment must first of all be sent to the board of prison industries in order that anything made in the penitentiaries of the state may be substituted for his specifications, and that too regardless of price, over which neither he, nor the purchasing agent, nor even the board of trustees, has the slightest authority or even influence.

And still his troubles are not finished. Unkindest cut of all, he may not even select the assistant upon whose skill and faithfulness the outcome will largely depend. This assistant, secretary, clerk, or stenographer, whatever he may happen to be, will be selected upon examination by an outside body miles away, consisting of men appointed under half the salary of the investigator—and glad to get it—men who were never in his or any other man's laboratory, yet who presume to say and do say who shall be employed and who shall not be employed.

Not only are assistants appointed from without, but that form of administration which consists of reviewing projects or other supervision is performed by men appointed after the same manner. In this way it often happens that a mediocre neophyte "supervises" the investigations of his own teacher who was indiscreet enough and tender-hearted enough a few years ago to give him a passing mark against his own better judgment.

As a final blow to his personal pride and enthusiasm, this investigator learns that he will be unable to report his results in the form he most desires because the state printer or the prison shop is unwilling, or what is more likely unable, to do the work as it should be done, neither will they "release" the job that it may be done as it would appear in ordinary work from institutions not overriden by administration.

He even learns that the very building in which he works, and whose insufferable ugliness and unnecessary cost have amazed him, was planned by a state architect, overruling the supervising architect of the university; and that the building across the way, of another form of ugliness and inefficiency, was executed by another state architect of a succeeding "administration," again overruling the institution, its school of architecture, and its board of trustees, even though the autocrat knew so little of his business as to be unable to draw plans and specifications upon which builders would file a bid. So do administration and law prevail over knowledge, needs and reason, for this is an actual experience.

This investigator, discouraged, disgusted, if not disheartened at least with the keen edge of inquiry long since dulled, says in his heart: "I will arise and hie me to another institution where the needs of the work are held supreme over methods of procedure and exploitation of positions and funds."

Vain hope! He may find temporary relief at certain points, but it is only temporary, for the conditions described, while not all as yet operative in any one place, are every one in operation to-day somewhere among institutions given to agricultural research and are rapidly extending to all the publicly supported institutions.

As a last example of the absurd extent to which administration has been pushed, this investigator—qualified by long years of training and experience—will find, in not one but many institutions, that should his duties lead him outside the confines of his

state, he may not go at public expense *without the permission of the governor.*

His own knowledge of the needs, his training, judgment and loyalty count for nothing. His desire to economize funds, dearer to him than to anybody else, funds that have been exploited time and again by officers over whom neither he nor the board of trustees have the slightest control—this desire is no guarantee of his judgment. The opinion of the head of the department does not count. The recommendation of the president is void of meaning. The action of the board of trustees is impotent. The question must go to the governor of the state—this mighty question as to whether Dr. Blank, scientist at $4,000 per year, may step across the border to consult his brother scientist and have his expense bill of $7.93 paid from funds appropriated by the legislature and set aside by the trustees for this very purpose. Ye gods, where are we drifting!!

If this burden were from within the institution the case would be different, because it could the more easily be removed. But it is inflicted from without under the pretext of auditing, or of efficiency, and with certain federal funds we have reached a stage of affairs such that the specialist may work only in "cooperation" with offices a thousand, perhaps two thousand, miles away and represented by men who know little of the local conditions involved—a cooperation at best that is purely administrative, mostly restrictive, wholly artificial, and defensible only as a means of administration. So has administration become not only supervision, but actual cooperation, under which the last opportunity for personal initiative and the best service is taken away.

All this is done in the name of one or the other of two agencies—the administration of public funds, or the demands of efficiency.

Officers connected with federal and state administration seem to be unable to distinguish between the business of auditing and that of supervision. They reason that if they are in any way to certify funds they must also approve the work. In this way has ordinary auditing developed within twenty-five years into what was at first inspection of work and at last a kind of "cooperation" in which the one to be held responsible for results is under the dominance of authority entirely outside the institution which he serves. In this way an outside individual, even a minor officer, is able to overrule a university and its entire administrative machinery.

Efficiency is more insidious, for it works under the guise of service and proves by figures that scientists, teachers and others in the public service must be standardized in order to be made efficient, and before this car of Juggernaut, training, loyalty, counsel, experience, even deliberative acts of boards of trustees of successful and high-minded citizens serving without salary do not count as against a small group of self-selected and politically appointed individuals shut up in an office miles away with neither special training, knowledge of the situation nor other qualification to enter our laboratories but the blind authority of law working in the dark and largely through individuals who would never, except by the accidental working of law, be connected in any way with our work. So are useless and pestiferous positions multiplied and made parasitic upon a most excellent service.

LITTLE ADMINISTRATION NECESSARY

Administration can not vitalize research. Its whole effect is restrictive and hence should be reduced to a minimum. That it

is not necessary to good work is shown by the seventy-five years' experience at Rothamsted. That auditing accomplishes all that is necessary in addition to the public reports of responsible boards of trustees is shown by the experience of numerous institutions not yet under the blighting effects of too much administration. That administration is recognized as a deterrent to good work is shown by the struggles of the state universities everywhere, not only to free themselves from this outside dominance that is wasting funds, and crushing the life out of institutions and men, but they are also simplifying their own internal machinery to the end that nothing should come between the worker and his work.

All progress in science is the result of individual interest, initiative, invention and energy, all of which must be resident in the worker. The driving force that brings results is internal, not external, to the explorer after new truth. It beckons from ahead and does not prod from behind. It is akin to that attraction which drew explorers time after time to the pole, and not akin to the whip that sends the slave to the galley or the cotton field.

Administration does no work. It is a harness put upon activity. Its purpose is not to actuate, but to restrain and forbid, as witness the multitude of laws, boards, commissions, decisions and rulings that have grown up—all restrictive. "Thou shalt not" is the burden of most administrative legislation and office rulings.

The effect is delay, added expense, discouragement of men, and unsatisfactory service at every step, for after engaging the best available men, administration proceeds to tie their hands and to exploit their funds.

Effects of Administration on Men

The effect of too much administration upon the scientific worker is at first one of disappointment, then of discouragement, and finally of disgust. Conditions as they are now developing not only constitute an unhealthy example for our young men in college, but they are deterring thoughtful men from entering the public service. Real men are unwilling to subject themselves to unnecessary restriction and petty annoyances, the obvious exploitation of funds and the artificial multiplication of administrative positions, with their overhead charges upon research and their power to bring reproach upon the best intentions and the most faithful service. There is danger to everybody when the crash comes, as it will come when the public begins to understand the foreign forces that have attached themselves to the serious business of research in agriculture.

But it is objected that without supervision much time and money are wasted; besides some men are lazy. Granted without argument! As to waste of time and money, some of both is inevitable. Many excursions were made northward before the pole was conquered. Perhaps some money, even lives, were wasted, but not the attempt as a whole. At the most no scheme could be invented that so inevitably leads to time service and fraud as the one now building up around our institutions where the public is made to feel that nobody is either honest or capable save the "inspector" and the appointed overlord who gets his commission by executive appointment and reports to nobody. What guarantee have we of his honesty?

Modern efficiency standards are developed from the manufacture of shoes, clothes-pins, overalls, etc., and are expressed in motions per hour. These standards are not applicable to research. Money put into research is bread cast upon the waters. In the serious business of searching after new truth, no man knows in advance the road

that shall be traveled before he may stand upon the heights. He may be held down, but he can not be pushed up. No power on earth is so impelling as his own initiative and determination to achieve.

Under what project did Darwin work? Did Faraday report regularly upon the progress of his mental wanderings after firm resting places? Could the searchers after the principle of radioactivity report progress from time to time? How shall we, even in the interest of efficiency, record the Sermon on the Mount or the Gettysburg address in terms of laboratory hours? Go to, we are dealing with strange gods at this point. Let us be forgiven and return to the worship of the true Deity which is ready to recognize the individual as the source of all real discovery and which is willing to accredit him with as much of honesty of purpose, and of faithfulness to the public as the political appointee, also an hireling. Above all let us not set up to rule over us machinery that is manned by those individuals who could not themselves do the work they attempt to supervise. And above all I protest against the present temper of the public mind which has been tampered with by professional exploiters until it is unwilling to trust its business in the hands of boards or other deliberative bodies even when composed of reputable citizens busy for the most part about their own affairs, but overrules their judgment by exalting individuals who have no occupation of their own but whose profession it is to multiply and to fill administrative positions, that render no service but that hinder mightily the progress of the true scientist whose one occupation is research.

Here have come together the working scientist and the professional officeholder. They face in opposite directions. At present the office man has the upper hand. He assumes the rôle of critic and the public has accorded him all he asks. The time will come, however, and may it not be long delayed, when the scientist will again come into his own and the institution to which he belongs will recognize no overlord, except the auditor, who will be an auditor, not an autocrat in technical science.

THE RANGE

So thoroughly has chemistry taken the lead as a science fundamental to all improvement in agriculture that the terms are sometimes used synonymously. However, the outlook for the development of other sciences in their relation to agriculture is extremely suggestive. Physics, for example, has never consciously served farming. I know of but two graduate students in agriculture who have specialized in physics, and it was the experience of both that physicists were somewhat surprised to learn that their science could be of the slightest use in agriculture, whereas the facts are, it is of fundamental importance at many points.

Both botany and zoology possess undeveloped opportunities little dreamed of. They have in the past served agriculture mainly in the field of genetics or of animal and plant diseases. We are only beginning to study crop production from the standpoint of the physiology of the plant, its sensitive periods and the conditions essential to successful growth.

As a whole we have only scratched the surface of science in its relation to the practise of farming. The outlook is nothing short of a panorama to him who has an adequate vision of the future and the ability to work in any one of the great fields of science, distinguishing clearly between science *per se* and its application to the arts of man.

The writer is not pessimistic and is in no sense discouraged with the outlook. He is

concerned only with matters as they stand. Some of the conditions of which we complain are accidental and deplored as much by the administrative officers who happen to be in charge as by the scientific workers in the laboratories. Others are the result of a more or less wholesale desire to exploit a situation which enjoys large appropriations of public funds. This is the element that must be sloughed off at all cost.

The public who is to be served and who pays the bills will ultimately clean the stables, if only the scientists and the institutions who have permanent reputations to defend and who outlive successive generations of appointed overseers will be true to their responsibilities and insist upon working conditions favorable to reasonable results.

No other branch of science is so richly endowed as is agriculture; no other promises such important results; no other has so large an army of men faithful to their duties; no other so enjoys the confidence of the public. The question is, shall agricultural science with all these advantages weighed against the disadvantages be stronger or weaker than other branches of study, and can the publicly supported institutions with superior revenues afford equal advantages for research as compared with independent institutions resting upon private funds?

E. Davenport

University of Illinois

SCIENTIFIC EVENTS

SIGMA XI IN DULUTH, MINN.

The "Quarter Century Record and History" of Sigma Xi appeared in 1913. It contained, among other valuable information, the names and addresses of all those elected to Sigma Xi up to December 31, 1911. Mr. Eugene Van Cleef conceived the idea of organizing the members residing in Duluth, believing that such an organization could prove more or less successful. As a result of a little correspondence and personal interviews "The Society of Sigma Xi of Duluth, Minn.," was consummated with 10 charter members in July, 1913.

Meetings are held bimonthly. A dinner is served after which an informal paper is presented by one of the members and discussed by all. The wives of the members and a lady friend of each of the unmarried members may be guests at any meeting. Their attendance has been almost as regular as that of the men.

Each paper has covered some phase of the work in which the respective members are engaged. The nature of these presentations may be gained from some of the following titles selected at random: Heredity and Environment; The Valuation of Public Utilities; Design and Construction of the Aerial Bridge at Duluth; Climate and Man; The Learning Process and Acquisition of Skill, etc.

At present the membership consists of 3 mechanical engineers, 1 civil engineer, 1 agriculturist, 1 geographer, 1 physician and 1 psychologist. With such a variety of interests represented each one is assured of receiving information worth while at each meeting. The discussions are thoroughly alive and stimulating.

That the meetings have been worth much to each one is attested by the fact that the attendance for the past four years has been almost perfect, no one being absent unless because of circumstances over which they have had no control.

This announcement is made to the readers of Science, in the belief that others may care to adopt the idea in the locality in which they are now residing. There seems to be no reason for the cessation of interest in the welfare of Sigma Xi just because one is not engaged in academic work. The spirit of research should live after college days among all members of Sigma Xi, regardless of the course in life which they may pursue. Details of the organization in Duluth, not cited above, will be gladly given to any who may apply to the undersigned.

Eugene Van Cleef

State Normal School,
Duluth, Minn.

THE HANCOCK MINERAL COLLECTION

As somewhat exaggerated accounts of this collection appeared in the newspapers at the time of its purchase for the Harvard Mineralogical Museum a brief description is opportune.

Elwood P. Hancock who died last December in Burlington, N. J., in his eighty-second year, was a landscape artist by profession and also carved in wood as a pastime; he began to collect minerals when nineteen years old and continued throughout his life. To this pursuit he brought the artist's eye and skilled manipulation with fine tools as well as a wonderful "flair" for fine specimens even when the crystals were buried in the matrix, and acquired a keen acquaintance with minerals. For many years he visited Franklin Furnace twice yearly, and made trips to Paterson, Nova Scotia, Virginia, North Carolina and other famous American mineral localities, and the choice specimens he brought back were worked out with incredible skill to show their beauty, with hardly a suspicion that tools had been used to clear away the matrix.

The collection contains about 1,600 specimens of generally the first quality, usually matrix specimens showing good crystals. The standard European and other non-American localities are fairly represented with excellent and well-chosen material but the greater interest is in the superb crystals from American localities such as Franklin Furnace, Tilly Foster mine, Amelia Court House, Va., and others where Mr. Hancock collected on the spot and then worked out his material with incredible skill and patience.

JOHN E. WOLFF

HARVARD UNIVERSITY

AMERICAN ACADEMY OF PUBLIC HEALTH

THE organization of this society, which was formed at a meeting held in Cincinnati, October 23, 1916, has been noted in SCIENCE. The *New York Medical Journal* states that a constitution was adopted stating that the objects of the new organization are to increase the efficiency of its members through the discussion of public health problems, to promote the efficiency of public health administration, to raise the standards of public health practise, and to stimulate original work in public health science. Qualifications for membership are based upon achievements as public health workers and scholarship in public health science. There are two classes of members: Active members, who must be, at the time of election, not less than thirty years of age and actively engaged in public health work, and honorary members who are chosen in recognition of unusual ability or length of service in public health work. When the membership has reached fifty, not more than five new members shall be added in any one year, in addition to filling vacancies. At the meetings of the organization it is not proposed to read scientific papers, but to devote the time to the open discussion of the reports of committees. During the year the various commitees will be called upon to prepare reports on such public health problems as are suggested by the membership, and their reports will be placed in the hands of the members several weeks in advance of the annual meeting so that the members may come to the meetings prepared to discuss the same intelligently. It is planned to publish from time to time the opinions which the membership of this academy may reach as the result of their deliberations on the problems presented to them. The members of the organization for the first year are: Dr. Carl L. Alsberg, Dr. John F. Anderson, Dr. Hermann M. Biggs, Dr. Rupert Blue, Dr. Charles V. Chapin, Dr. H. W. Conn, Dr. Haven Emerson, Dr. W. A. Evans, Dr. Irving Fisher, Dr. Lee K. Frankel, Dr. Allen W. Freeman, Dr. Wade H. Frost, Dr. George W. Fuller, Dr. John S. Fulton, Dr. Joseph Goldberger, Dr. S. S. Goldwater, Dr. William C. Gorgas, Dr. Selskar M. Gunn, Dr. Frederick L. Hoffman, Dr. J. N. Hurty, Dr. E. O. Jordan, Dr. J. W. Kerr, Dr. J. J. Kinyoun, Dr. J. H. Landis, Dr. E. C. Levy, Dr. L. L. Lumsden, Dr. G. W. McCoy, Dr. A. J. McLaughlin, Dr. Joseph S. Neff, Dr. Charles E. North, Dr. William H. Park, Dr. Earle B. Phelps, Dr. W. S. Rankin, Dr. M. P. Ravenel, Dr. M. J. Rosenau, Dr. William T. Sedgwick, Dr. W. F. Snow, Dr. C. W. Stiles,

Dr. J. W. Trask, Dr. Victor C. Vaughan, Dr. William H. Welch, Dr. George C. Whipple, Dr. C.-E. A. Winslow, Dr. William C. Woodward.

SCIENTIFIC NOTES AND NEWS

Professor R. A. Cooley, state entomologist and professor of zoology at the Montana State College, has been elected president of the American Association of Economic Entomologists.

At the annual meeting of the Society of American Bacteriologists officers were elected as follows: *President,* Professor L. F. Rettger, of the Sheffield Scientific School; *Vice-president,* Dr. R. E. Buchanan, Iowa State College; *Secretary and Treasurer,* Dr. A. Parker Hutchins, Glenolden; *Delegate* to council of the American Association for the Advancement of Science, Dr. P. F. Hadley, Kingston, R. I.; *council members,* Miss Jean Broadhurst, New York; Dr. P. F. Clark, Wisconsin; Dr. L. A. Rogers, Washington, D. C., and A. E. Ingham, Boston.

Professor W. F. M. Goss, dean of the college of engineering of the University of Illinois, has resigned to accept the presidency of the Railway Car Manufacturers' Association of New York. The resignation will take effect as soon as Dr. Goss can be relieved.

General George W. Goethals, recently chief engineer of the Panama Canal and governor of the Canal Zone, has announced the opening of consulting engineering offices in New York City. General Goethals has associated with him specialists, including George M. Wells, former resident engineer in charge of building construction, Canal Zone, and will engage in a general consulting practise in civil, electrical, mechanical and hydraulic engineering.

In memory of Judge Harvey H. Baker, of the Boston Juvenile Court, there has been established a Judge Baker Foundation. Dr. William Healy, director of the Psychopathic Institute of the Juvenile Court of Cook County, will have charge of the work of the new foundation.

The Delalande-Guérineau prize of the Paris Academy of Sciences has been awarded to Sir Ernest Shackleton, for his explorations in the Antarctic continent.

The Boyle medal of the Royal Dublin Society has been conferred on Professor Henry H. Dixon, professor of botany in the University of Dublin.

At a stated meeting of the New York Academy of Medicine on February 1, Dr. Walter B. James announced that the portrait of Dr. William M. Polk had been presented to the academy, and that this completed the full line of portraits of presidents of the academy. Dr. George D. Stewart made the address of acceptance on behalf of the academy. The portrait is the work of Miss Belle Isaacs.

The twelfth annual banquet of the Cornell Society of Civil Engineers at the Hotel Breslin, New York, on January 19, was given in honor of Professor Irving Porter Church. Nearly a hundred and fifty engineers were present.

Before leaving the United States to spend a year in the far east, Dr. Liberty Hyde Bailey was the guest at a dinner given by the members of the Ithaca Board of Commerce and his fellow members of the Cornell faculty. Roger B. Williams, trustee of the university, was toastmaster. The speakers were Dr. W. H. Jordan, head of the State Experimental Station at Geneva; Dean A. W. Smith, of the College of Mechanical Engineering; Dean A. R. Mann, of the College of Agriculture; Dean C. A. Martin, of the College of Architecture; Dean E. H. Haskell, of the College of Civil Engineering; Professor Nathaniel Schmidt, of the department of Semitics, and Jacob Rothschild, chairman of the Board of Commerce.

Dr. Gregory D. Walcott, professor of philosophy and psychology in Hamline University, has been given a year's leave of absence to teach psychology and logic in the government college of Tsing Hua, China. He expects to sail from San Francisco about the first of next July and to be abroad until September, 1918.

DR. R. SAUNDBY has been appointed by the Royal College of Physicians, London, Harveian Orator; Dr. E. S. Reynolds to be Bradshaw Lecturer for this year, and Dr. T. M. Legge to be Milroy Lecturer for 1918.

AT the Royal Institution Professor C. S. Sherrington is giving a course of six lectures on "The Old Brain and the New Brain, and their Meaning," and Mr. A. R. Hinks, F.R.S., two lectures, on "The Lakes and Mountains of Central Africa."

RUDOLF VON VIRCHOW'S family have donated to the Berlin "Goldsammelstelle" seven gold medals that had been conferred on Virchow by foreign scientific organizations. The medals have a total weight of 1,200 gm. and are valued at about $650. The heirs of Mommsen have taken a similar step, turning in to the gold reserve the medals that had been awarded to Mommsen in his day.

THE Chemical Society of France held a memorial meeting, on December 9, on the hundredth anniversary of the birth of the French chemist, C. F. Gerhardt, 1816–1856, known for his work on the structure of the molecule.

MR. ANDREA ANGEL, chief chemist at the factory at Woolwich where the recent explosion occurred, the story of whose self-sacrifice is told in the official report of the disaster, was born in 1877. Educated at Christ Church, Oxford, he was lecturer in natural science at Brasenose and also hon. tutor in chemistry to the non-collegiate students.

PROFESSOR E. GAUPP, professor of anatomy in Breslau, died on November 24, 1916.

THE death is announced of the former professor of ophthalmology at the Universities of Bern and Rostock, Dr. von Zehender, aged ninety-one years.

IN preparation for the next annual meeting of the American Medical Association, which is to be held in New York during the week of June 4–10, a large committee of local physicians has been formed charged with perfecting the details necessary to make such a meeting a success. Dr. Wendell C. Phillips is chairman, Dr. Alexander Lambert is treasurer and Dr. Floyd M. Crandall is secretary of the New York Committee of Arrangements. The headquarters of the committee are in the Academy of Medicine, 17 West 43d Street. Subcommittees have been formed dealing with finance, registration, entertainment, hotels, sections, scientific exhibit, commercial exhibit, press and publicity, and golf. On the two days preceding the meeting, namely, on June 4 and 5, there will be a clinical congress, during which clinics, demonstrations and tours of inspection will be conducted in hospitals, laboratories, clinics and scientific institutions throughout the city. The organization of the features to be made available at this time has been entrusted to over thirty different sections, representing general medicine, pharmacology and therapeutics, pathology and physiology, preventive medicine and hygiene, pediatrics, dermatology, neurology, mental diseases, general surgery, orthopedic surgery, gynecology, obstetrics, urology, rectum and colon, ophthalmology, otology, rhinology and laryngology, stomatology, roentgenology, anesthetics, and women physicians. In addition to this, there are sections dealing with allied topics, such as trained nursing and training schools, district nursing, hospital social service, planning and financing of municipal and non-municipal hospitals, hospital superintendents and executives, and military surgery and Red Cross.

A BILL prepared by the California state board of health carrying with it an appropriation of $500,000 provides for the establishment of a state psychopathic hospital to be located near the University of California Medical School in San Francisco, to be governed by the university regents with the professor of psychiatry as ex-officio director. The hospital is to provide not only a research laboratory but treatment for all patients requiring special or intensive study for a short period.

A NUMBER of members of the Kaiser Wilhelm Association have planned a German institute for research on psychiatry. The funds subscribed as yet do not permit an independent establishment, but it is proposed to organize an institute of the kind as a branch of the Munich psychiatric clinic.

The governor of Minnesota has recommended to the legislature that $25,000 be appropriated at the present session for the use of the state entomologist in combating white pine blister rust in Minnesota. As arranged, the plant pathologist of the experiment station and the state entomologist will work in cooperation the coming season; the plant pathologist to have charge of scouting and eradication along the eastern border of Minnesota in the St. Croix Valley; the state entomologist, by virtue of his office as nursery inspector, will take care of inspection and eradication in nurseries, parks, cemeteries and private plantings. It is expected that the state of Wisconsin will cooperate energetically on its side of the St. Croix River.

UNIVERSITY AND EDUCATIONAL NEWS

Through the generosity of a friend of Harvard University, who prefers to remain unknown, there has been established an assistant professorship of bacteriology in the Harvard Medical School, to be known as the Silas Arnold Houghton Professorship. In the words of the donor, the gift is made "in grateful memory of Dr. Houghton as a physician and a friend."

M. G. Kains, professor of horticulture and horticulturist at the Pennsylvania College and Station, has resigned and has been succeeded by Dr. S. W. Fletcher, formerly director of the Virginia Station.

Dr. H. B. Fantham, of Christ's College, Cambridge, has been appointed to the professorship of zoology at the South African School of Mines and Technology, Johannesburg, and Dr. C. E. Moss, of Emmanuel College, has been appointed professor of botany to the same institution.

At London University Mr. James John Guest, B.A., of Trinity College, Cambridge, has been appointed to the university readership in graphics and structural engineering, tenable at University College, in succession to Dr. W. H. Eccles, reader in graphics, who has been appointed professor of applied physics and electrical engineering at Finsbury Technical College.

DISCUSSION AND CORRESPONDENCE

THE SLIDES OF THE PANAMA CANAL

To the Editor of Science: In view of the fact that portions of the annual report of the governor of the Panama Canal for the fiscal year ending June 30, 1916, containing criticisms of the writer's views of the canal slides have been published recently in many newspapers throughout the country, the writer is impelled to make the following statement.

The governor implies in his report that the sole basis for the writer's expressed opinion that "practically all of Gold Hill and much of Zion Hill must be removed" "before the Canal can be said to be completed and permanently opened to traffic" was, as he states, an investigation of "fully three or four hours" and says that he (the writer) stated that he had made a "thorough examination." In the first place, the writer did not state that he had made a "thorough examination," these words being used without the writer's knowledge. Whether the examination was sufficiently thorough and enough information obtained to justify an expression of opinion may be determined from the following statements.

It is doubtful whether any other activity of the government has ever received equal publicity through the press, official reports, lectures and descriptions of returned visitors and employees as has the Panama Canal during its construction, so that there has been no excuse for any interested person not having exact and detailed information concerning the canal project.

The writer, as well as most geologists, had his interest aroused several years ago, by the unexpected difficulties encountered by the Panama Canal engineers. This was especially the case because it was evident that the combination of geological and climatic conditions prevailing there were mainly responsible for the troubles. From careful studies of much published and unpublished data the writer was fairly familiar with the situation long before the opportunity came to visit the region.

On returning from an extensive trip through the South American continent, the writer

spent October 22, 23, and November 1–4, 1915, in the Canal Zone and the intervening time, October 24–31, in Costa Rica. During the period heavy downpours of rain were frequent in both Panama and Costa Rica and landslides were especially active. Numerous landslides were observed in Costa Rica. While there, also, opportunity was afforded in the Aguacate gold mines to observe the great depth to which oxidation and rock decomposition extends in a region where the climatic conditions are similar to those prevailing in Panama.

On returning to Panama a landslide was seen along the line of the Panama Railroad which interfered with traffic for a short time. The forenoon and early part of the afternoon of November 2 were spent in going over the entire area then in movement on both sides of the Gaillard Cut and also a trip across the Cucaracha slide and entirely around Gold Hill. The area affected by the slides is 0.88 mile in length along the canal and extends back 1,400 feet on the east side of the canal and 1,200 feet on the west, a large part of which was then in actual movement. In the afternoon, through the courtesy of the Canal Commission officials, some time was spent in the examination of unpublished cross sections of the cut made during the process of steam-shovel excavation.

The information obtained seemed sufficient on which to base an opinion and forced the conclusion upon the writer that the slide conditions were more serious than commonly supposed and influenced him in giving expression to his views. Subsequent movements seemed to prove that the seriousness of the situation had not been generally appreciated.

In the governor's report it is stated that "probably the greatest injury done the Canal was through Benjamin Le Roy Miller, Ph.D., who occupies the chair of geology in Lehigh University." The writer can not accept such responsibility and believes that the "greatest injury done the Canal" has been the frequent disappointments to the shipping public, due in part to the closing of the canal and the uncertainty regarding its use, but in a large measure to the over-optimistic reports emanating from the Canal Zone that the slides would shortly cease and permanent service be established by the clearing of the channel. It should be recalled that the canal was closed to traffic for over 4½ months after the writer's conclusions were published, although the shipping public was led to believe that service would be re-established and maintained with comparatively little delay. As stated in the governor's report the canal was closed 232 days, between the date of opening, August 15, 1914, and June 18, 1916, slightly more than one third the time. These facts undoubtedly furnish other and more weighty reasons for the shipping public's loss of confidence in the present usefulness of the canal than the expression of opinion of a visiting geologist.

The writer agrees with Dr. J. C. Branner, president emeritus of Stanford University, who was a member of the Committee of the National Academy of Sciences that went to Panama last December at the request of President Wilson to study the slides and prepare a report upon them, in statements which he made in *Sunset, the Pacific Monthly,* for June, 1916. He says:

> But when one sees the sliding area extending further and further away from the Canal, the volume of the moving masses gradually getting bigger and bigger, and the very hills themselves toppling over and adding to the confusion trees, mud, rocks and great blocks of basalt as big as houses, and when he sees that these millions of tons, that have to be removed, cost about sixty cents a cubic yard, he feels that some way ought to be found to make the hills stay where they are.

How shall the hills be made to "stay where they are" is the question? Dr. Branner as the result of "forty years of study of landslides in tropical countries" believes that this can only be effected by preventing the heavy rainfall of the region from entering the ground adjacent to the canal. It is somewhat questionable whether this can be accomplished and, if not, there seems no alternative but the complete removal of the threatening hills. Perhaps some unnecessary material might be removed but this would be fully compensated for by the increased confidence in the canal. One writer states:

It may be accepted as a fact that, unless dredging is supplemented by preventive measures, slides will continue to fill the Canal prism at intervals for an indefinite period, that traffic through the Canal will be interrupted for weeks and months at a time and that the expense of removing the slide material will add millions to the investment. As a commercial undertaking the Canal will be a flat failure unless continuous traffic through the waterway can be guaranteed; if extensive delays due to slides occur every fall when the effect of the summer deluge is felt, schedules, rates and contracts will be disturbed so frequently that fifty per cent. of the Canal's usefulness will be gone, even if the closed season lasts for only a few weeks at a time.

Aside from its commercial aspect, the Panama Canal was designed to be one of the country's most important defensive works. A continuation of the slides at frequent intervals will render the ditch worthless as a defense measure. . . .

Half a canal is worse than no canal. Muffled exclamations of admiration will not stop the slides. Unless the slides are stopped, definitely and permanently, the Canal is a failure as a commercial undertaking and a defense measure. Dredging the débris will not stop the slides.[1]

Neither Dr. Branner, the writer, nor any other patriotic citizen would intentionally circulate false reports in regard to existing conditions in the Panama Canal region nor venture to make predictions that might unduly alarm the public, but, on the other hand, nothing is gained by fostering a false sense of security.

In England, Germany and Russia reports of the failure of the canal are said to have been freely circulated. These reports have emanated from geologists and engineers and seem to have led many of the people in those countries to believe that the Panama Canal would eventually be abandoned and the Nicaragua route substituted. These reports either exaggerate the importance of the slides or underestimate the will of the people of this country. If the earthquake menace, to which Dr. Branner calls attention in his article in *Sunset,* does not materialize, the Panama Canal will unquestionably be completed and made to serve its intended purpose, even though it require years of time and the expenditure of additional millions of dollars to accomplish. The American people would not willingly abandon a project that has so stirred the pride and stimulated the patriotism of the entire country as has the Panama Canal, even though the length of time for its completion and its cost far exceed the early calculations.

[1] Editorial in *Sunset, the Pacific Monthly,* June, 1916, p. 35.

Benj. L. Miller

Lehigh University,
December 12, 1916

SCIENTIFIC BOOKS

Field Geology. By Frederick H. Lahee, Assistant Professor of Geology in the Massachusetts Institute of Technology. McGraw Hill Book Co., 1916.

The title of this book suggests two possible ways in which it may be used; as a preparation for field work, and a hand-book in the field. It is for the latter use, as a reference book in the field, that it will be found to be especially valuable.

The plan of the author is an unusual and, in the reviewer's opinion, a very desirable one. "Where possible the treatment has been empirical rather than genetic." Two examples will illustrate this method of presentation. Under Hills, Ridges and Other Positive Land Forms are included (1) Fault Mountains, (2) Volcanic Cones, (3) Constructional Hills and Ridges, such as sand dunes, drumlins, eskers, kames, moraines and winter talus ridges. Under Cross-bedding are included (1) Delta Structure, (2) Torrential Cross-bedding, (3) Wave-built Cross-bedding, (4) Eolian Cross-bedding, and (5) Ripple marks. In other words, forms which look alike are classed together without regard to their origin.

A number of tables for the identification of structures and topographic forms are scattered through the text and included in the appendix. These analyses have been prepared with almost as much care and detail as are those in botanies for the identification of flowering plants. Especially is this true of the table of clastic sedimentary rocks (pp. 463–471). It is doubtful, however, if these tables will prove of great value in the field as

they are academic rather than practical. They will probably confuse the elementary student and will not be of great help to the advanced student. This painstaking analysis of the subject, however, has resulted in an admirable selection of material and an unusually logical presentation.

Mention should be made of the excellent block diagrams, of which there are more than 100, and of the numerous sections. Many of these drawings are new and are of great value, especially in the presentation of structural geology.

The typographical mistakes and occasional slight errors in statement which seem impossible to eliminate in a first edition will, doubtless, be absent in the second printing. Many who use the book will regret that a fuller discussion of the plane table is not given.

The limp covers, small size and light weight make this a convenient volume to carry about in the field, and both students who have only an elementary knowledge of geology and seasoned geologists will find the book a useful field companion.

HERDMAN F. CLELAND
WILLIAMS COLLEGE,
WILLIAMSTOWN, MASS.

The Endocrine Organs. By E. A. SHÄFER. Longmans, Green and Company. London, 1916. Pp. 156.

The author has endeavored to compress into this book a great number of observations concerning the organs of internal secretion. He has not published a bibliography, this task having been recently performed by Biedl and by Vincent. As each of the organs is taken up the facts of its embryology and structure are briefly presented. Then we have an account of the properties of the extract and of the conditions produced by excessive and deficient activity, ablation furnishing the limiting case. There are well-chosen plates and tracings to the number of 104.

The attempt to read the chapters consecutively results in an oppressive realization of the magnitude of the subject. During the last few years emphasis has been increasingly upon the reciprocal relations of the several organs. As each may reinforce, oppose, or otherwise modify the influence of every other, we have here a number of possibilities which increases according to the principle of permutations and combinations. The writer of the book has not neglected this aspect of the matter, but has wisely restricted his discussion to the more striking instances. His condensed account of the work of hormones and chalones (excitants and inhibitors) in the animal economy will give any reader a wide, preliminary view of a field the importance of which we are but just coming to appreciate.

P. G. STILES

RACE HYGIENE IN NORWAY

THE Norwegian government under the lead of Professor Jon Alfred Mjöen, of Christiania, well known for his researches in race hygiene, and on the direct effect of alcohol on the integrity of germ cells, has under way a program of Applied Race Hygiene. As planned by Professor Mjöen this will involve:

A. NEGATIVE RACE HYGIENE

Segregation, optional for feeble-minded, epileptics and other individuals physically or mentally crippled, *obligatory* for drunkards, habitual criminals and professional beggars and all who refuse to work.

Sterilization.—Professor Mjöen is opposed to compulsory sterilization. But for certain types of crime, there is earnest need of considering methods of treatment more effective than those now in use.

B. POSITIVE RACE HYGIENE

Biological Enlightenment.—The study of race biology in school and university. The development of an institute for genealogical research. A state laboratory of race hygiene.

Decentralization.—Colonization from congested districts.

A *regressive tax* and *progressive* wage system in certain conditions.

Maternity Insurance and other protective measures for the welfare of the infant.

C. PROPHYLACTIC RACE HYGIENE

Abatement of Racial Poisons, lead compounds, narcotics, syphilis and especially the use of alcohol.

Progressive Taxation of alcoholic liquors.

Treatment as a state function, of all maladies injurious to the race (alcoholism, plumbism, narcotism, syphilis, gonorrhea).

Health Declaration as a requisite to marriage.

Of these maternity insurance and the last three items have been already put into operation by the government.

Under the title of "Race hygiene," Dr. Mjöen has lately published, in Norwegian, an important work setting forth the scientific reasons for each of the lines of action proposed.

David Starr Jordan

A CENSUS OF THE PERIODICAL LITERATURE OF CHEMISTRY PUBLISHED IN THE UNITED STATES

During recent years there has been a rapid increase in chemical research in the United States. The statistics given in the following tables have been compiled to secure a rough estimate of this increase. In examining the tables it should be remembered that they are of value only in giving a statistical measure of the growth of chemical research and that the details are liable to be misleading. It sometimes happens that a single paper covering a few pages is of far greater value than dozens of other papers which may cover hundreds of pages.

In the tables only original papers have been considered and papers of less than one page were not included. One page of the *Journal of Industrial and Engineering Chemistry* has been counted as equal to three pages of the other journals. The journals selected for comparison are:

American Chemical Journal,
Journal of the American Chemical Society,
Journal of Physical Chemistry,
Journal of Biological Chemistry,
Journal of Industrial and Engineering Chemistry.

In preparing the data all articles were listed on cards and the cards grouped in different ways to prepare the successive tables.

TABLE I

Total Number of Articles and Pages in Each Journal

Years	*Am. Ch. J.*		*J. A. C. S.*		*J. Phys. C.*		*J. Biol. C.*		*J. I. E. C.*		Totals	
	Articles	Pages	Articles	Pages	Articles	Pages	Articles	Pages	Articles	Pages	Articles	Pages
1909–10	88	1,704	338	2,658	62	1,429	133	1,519	175	1,915	796	9,225
1914–15	....	....	542	5,003	81	1,388	402	3,810	390	3,423	1,415	13,624

Gain

	Articles	Pages	Articles, Per Cent.	Pages, Per Cent.
Journal of Biological Chemistry	269	2,291	202	150
Journal of Industrial and Engineering Chemistry	218	1,508	124	78
Journal of the American Chemical Society	204	2,345	60	88
Journal of Physical Chemistry	19	—41	30	—2
Total	707	6,103	77	66

TABLE II

Distribution among Classes of Institutions

	1909–10		1914–15	
	Articles	Pages	Articles	Pages
A. General Scientific:				
Educational	597	7,235	902	9,165
Charitable	4	41	21	197
Research	43	443	133	1,277
B. Commercial Scientific:				
General	52	528	98	675
Analytical	4	53	1	6
Research	6	97	7	57
C. Government Bureaus, Experiment Stations, etc.	93	827	253	2,247
	796	9,225	1,415	13,624

TABLE III

Institutions which published Five or More Articles during the Four Years

	1909–10		1914–15	
	Articles	Pages	Articles	Pages
Arizona, University of	5	29	None	None
Armour and Company	None	None	5	20
Bryn Mawr College	7	119	4	61
Calcutta, India, Presidency College	None	None	18	107
California University	19	256	39	403
Carnegie Institution of Washington	8	131	19	281
Chicago, University of	36	430	16	234
Cincinnati, University of	1	5	9	126
Clark University	5	50	8	84
Columbia University	28	226	29	444
Columbia University and Roosevelt Hospital	None	None	6	75
Connecticut Agricultural Experiment Station (N. H.) and Yale University	None	None	10	144
Cornell University	32	1013	59	955
Cornell University, Medical College	7	73	20	261
Dodge and Olcott Company	None	None	5	29
General Electric Company	4	42	7	114
Hackney Technical Institute	6	35	None	None
Harvard University	31	396	61	652
Harvard University, Medical School	15	73	13	73
Harvard University, Medical School and Massachusetts General Hospital	None	None	9	61
Hawaii Agricultural Experiment Station	2	25	4	27
Herter Laboratory	19	153	7	51
Illinois, University of	45	504	33	281
Illinois, University of, and Jefferson Medical College	None	None	7	51
Iowa State College	None	None	17	122
Iowa, University of	4	21	8	105
Johns Hopkins University	33	825	28	349
Kansas Agricultural College	None	None	8	17
Kansas, University of	3	17	8	125
Kentucky, University of	3	9	8	52
Leland Stanford Junior University	3	23	7	104
Little, A. D., Company Laboratory	5	81	2	27
McGill University	4	31	7	49
McMaster University	6	56	None	None
Massachusetts Agricultural College (including station)	None	None	10	119
Massachusetts General Hospital	1	7	5	45
Massachusetts Institute of Technology	35	494	4	37
Mellon Institute	None	None	18	174
Michigan Agricultural College	1	13	5	31
Michigan, University of	8	123	17	189
Minnesota, University of	7	40	24	231
Missouri, University of	12	119	12	78
Montefiore Home and Hospital for Chronic Invalids	None	None	6	69
Morris and Company	3	13	3	10
Nebraska, University of	7	59	2	26
Nevada, University of	3	5	3	31
New Hampshire College	9	39	12	66
New York, College of the City of	4	20	6	44
New York (City) College of Physicians and Surgeons	4	61	1	9
New York (City) Postgraduate Medical School and Hospital	None	None	8	53
New York (City) University	5	44	None	None
New York (City) Testing Laboratories	3	31	5	35
New York (State) Agricultural Experiment Station	2	13	11	97
North Carolina, University of	11	117	5	29
Northwestern University	2	10	4	45
Northwestern University Medical School	None	None	6	65
Ohio Agricultural Experiment Station	4	27	3	34
Ohio, University of	5	36	7	83
Oregon Agricultural Experiment Station	4	31	5	30
Parke, Davis and Company	2	61	9	43
Pennsylvania State College	5	57	3	22

TABLE III—*Continued*

	1909–10		1914–15	
	Articles	Pages	Articles	Pages
Pennsylvania, University of	11	51	34	225
Philadelphia Polyclinic and College for Graduates in Medicine	None	None	5	40
Princeton University	7	56	10	77
Purdue University	1	5	6	21
Rockefeller Institute	10	143	54	431
Roosevelt Hospital, N. Y.	2	3	19	171
Rush Medical College	None	None	5	44
Tennessee, University of	3	18	6	40
Texas Agricultural Experiment Station	3	10	4	15
Texas, University of	4	81	4	39
Toronto University	8	167	7	53
U. S. Agriculture, Department of, and Missouri, University of	None	None	6	72
U. S. Animal Industry, Bureau of	None	None	5	51
U. S. Chemistry, Bureau of	24	209	29	173
U. S. Forest Products Laboratory	None	None	17	130
U. S. Geological Survey	4	27	6	41
U. S. Hygienic Laboratory	7	39	3	19
U. S. Mines, Bureau of	None	None	37	399
U. S. Mint, Bureau of	2	15	3	51
U. S. Plant Industry, Bureau of	None	None	9	63
U. S. Soils, Bureau of	14	198	21	154
U. S. Standards, Bureau of	2	7	13	111
Utah, University of	8	80	None	None
Washington State College	3	15	2	15
Washington, University of	5	29	17	134
Washington University, St. Louis	1	3	13	145
Wesleyan University	7	54	2	11
Western Reserve University	3	20	5	68
Wisconsin, University of	24	301	40	513
Yale University	39	413	61	532

TABLE IV

Institutions Which Published Ten or More Articles During 1909–10 Arranged in Order of the Number of Articles

	Articles	Pages
Illinois, University of	45	504
Yale University	39	413
Chicago, University of	36	430
Massachusetts Institute of Technology	35	494
Johns Hopkins University	33	825
Cornell University	32	1,013
Harvard University	31	396
Columbia University	28	226
U. S. Chemistry, Bureau of	24	209
Wisconsin, University of	24	301
California, University of	19	256
Herter Laboratory	19	153
Harvard University, Medical School.	15	73
U. S. Soils, Bureau of	14	198
Missouri, University of	12	119
North Carolina, University of	11	117
Pennsylvania, University of	11	51

TABLE V

Institutions Which Published Ten or More Articles During 1914–15, Arranged in Order of the Number of Articles

	1914–15	
	Articles	Pages
Harvard University	61	652
Yale University	61	532
Cornell University	59	955
Rockefeller Institute	54	431
Wisconsin, University of	40	513
California, University of	39	403
U. S. Mines, Bureau of	37	399
Pennsylvania, University of	34	225
Illinois, University of	33	281
Columbia University	29	444
U. S. Chemistry, Bureau of	29	173
Johns Hopkins University	28	349
Minnesota, University of	24	231
U. S. Soils, Bureau of	21	154
Cornell University, Medical College.	20	261
Carnegie Institution of Washington.	19	281
Roosevelt Hospital, N. Y.	19	171
Calcutta, India, Presidency College.	18	107
Mellon Institute	18	174
Iowa State College	17	122
Michigan, University of	17	189
U. S. Forest Products, Laboratory of	17	130

Washington (State), University of.	17	134
Chicago, University of	16	234
Harvard University, Medical School.	13	73
U. S. Standards, Bureau of	13	111
Washington University, St. Louis..	13	145
Missouri, University of	12	78
New Hampshire College	12	66
New York Agricultural Experiment Station, Geneva	11	97
Connecticut Agricultural Experiment Station and Yale University	10	144
Massachusetts Agricultural College	10	119
Princeton University	10	77

TABLE VI

Institutions represented in 1909–10, only....	76
Institutions represented in 1914–15, only....	198
Institutions represented in both periods.....	94
Total	368

Of the 198 new contributors in the second period, 89 appear in the *Journal of Industrial and Engineering Chemistry* only. These are chiefly commercial institutions.

In 1909–10 three fourths of the papers published came from educational institutions and in 1914–15 two thirds of the papers came from the same source. The large increase in the amount of work done in research institutions is notable.

MARION E. SPARKS,
W. A. NOYES

THE AMERICAN SOCIETY OF NATURALISTS

THE thirty-fourth annual meeting of the American Society of Naturalists was held at Columbia University, New York, December 29, and at the Carnegie Station for Experimental Evolution, Cold Spring Harbor, on December 30, 1916. In affiliation with the society this year were the American Association of Anatomists, the American Society of Zoologists and the Botanical Society of America.

The report of the treasurer, stating a balance on hand of $642.80, was accepted.

The following changes in the constitution, recommended by the executive committee, were authorized.

Article II., Section 2, last sentence to read: The name of any member two years in arrears for annual assessments shall be erased from the list of the society, and such person can only regain membership by reelection.

Article III., Section 1 to read: The officers of the society shall be a president, a vice-president, a secretary and a treasurer. These together with three past presidents and one member elected annually from the society at large shall constitute the executive committee of the society.

Article III., Section 2 to read: The president and vice-president shall be elected for a term of one year, the secretary and the treasurer for a term of three years. Each president on retirement shall serve on the executive committee for three years. The member of the executive committee elected from the society at large shall serve for one year. The election of officers shall take place at the annual meeting of the society, and their official term shall commence at the close of the meeting at which they are elected.

A recommendation to remove from the constitution section 3 of Article IV. failed to carry.

A motion that the society shall pay the secretary $50 and the treasurer $25 yearly for their services was laid on the table.

Resolutions, bearing on the working plan of the society, were presented by the executive committee and adopted by the society:

Resolved, that the American Society of Naturalists, composed as it is of the representatives of the several specialized fields of biology, should have as its constant purpose the furtherance of biological research and education in its broadest sense.

Resolved further that for the present the American Society of Naturalists can best attain this end by three forms of activity.

First. The holding of an annual dinner affording an opportunity for social contact among those working for the advancement of biology. On this occasion the president of the society shall have an opportunity through the annual address to express himself on a subject of broad biological interest and significance.

Second. The presentation of a symposium, arranged by the president, on some timely subject or problem relating to biological sciences.

Third. The presentation of a program, to consist primarily of research papers, on problems of organic evolution. The arrangement of this program in all respects, including its length, shall be in the hands of the program committee.

The following resolution offered by Edwin G. Conklin was adopted:

Whereas the National Academy of Sciences, at the request of the President of the United States, has organized a National Research Council for the purpose of promoting and coordinating research work, especially for national welfare, and

Whereas these are in part the purposes of the American Society of Naturalists,

Therefore, be it resolved that the American Society of Naturalists approves the organization of

the research council and desires to cooperate in its work in all ways which may be found practicable.

There were elected to membership: Edward W. Berry, Johns Hopkins University; Calvin B. Bridges, Columbia University; Douglas H. Campbell, Stanford University; E. Eleanor Carothers, University of Pennsylvania; Rhoda Erdmann, Rockefeller Institute; George F. Freeman, University of Arizona; Jann Kempton, U. S. Department of Agriculture; Sidney I. Kornhauser, Northwestern University; Edwin C. MacDowell, Carnegie Station for Experimental Evolution; Charles W. Metz, Carnegie Station for Experimental Evolution; David M. Mottier, Indiana University; Hermann J. Muller, Rice Institute; W. J. V. Osterhout, Harvard University; Edith M. Patch, Maine Agricultural Experiment Station; Alexander G. Ruthven, University of Michigan; William A. Setchell, University of California; Erwin F. Smith, U. S. Department of Agriculture; Alfred H. Sturtevant, Columbia University; David H. Wenrich, University of Pennsylvania.

The program of the Friday morning session, December 29, was as follows:

"Variation and Heredity in Peas," by O. E. White.

"Inheritance of Color Coats in Cats," by P. W. Whiting.

"Triple-allelomorphs in the Rat," by P. W. Whiting.

"Hybrids of *Zea tunicata* and *Zea ramosa*," by G. N. Collins.

"The Axial Rotation of Microorganisms and its Significance in Connection with the Present Theories of Evolution," by L. B. Walton.

"Deficiencies in the Genetic Materials of the Chromosomes of *Drosophila*," by C. B. Bridges.

"The Principle of Regional Inheritance as Exemplified in the Compositæ," by E. C. Jeffrey.

"The Genetic Behavior of *Œnothera cleistantha*." (Read by title.) By George H. Shull.

"Further Considerations of the Records of Alcoholic Guinea-pig Stock," by C. R. Stockard.

"Application of the Laws of Action, Reaction and Interaction in Life Evolution," by H. F. Osborn.

"The Influence of Castration on Hen Feathered Cocks of the P_1, F_1 and F_2 Generations," by T. H. Morgan.

"A Contribution to the Theory of Sex-determination," by R. B. Goldschmidt.

The session of Friday afternoon consisted of a symposium on the subject "Biology and National Existence."

"Biology and Preparedness," by Stewart Paton.

"Biology and the Nation's Food," by W. J. Spillman.

"Biology and Internationalism." (Read by title.) By V. L. Kellogg.

"Biology and War," by Jacques Loeb.

"Biology and Citizenship," by E. G. Conklin.

The Naturalists' dinner was held on the evening of December 29, at the Hotel Manhattan, with one hundred and five in attendance. The president's address by Dr. Raymond Pearl entitled "The Selection Problem," is published in *The American Naturalist* for February.

On Saturday, December 30, members of the Naturalists were most enjoyably entertained at Cold Spring Harbor by the staff of the Carnegie Station for Experimental Evolution. A morning program was held in Blackford Hall with the following papers:

"Parthenogenesis and Sex in *Anthrothrips*," by A. Franklin Shull.

"A Classification of Color Factors in Mammals," by Sewall Wright.

"Evidence of Multiple Factors and Segregation in Mice and Rats," by C. C. Little.

"A New Series of Multiple Allelomorphs in Maize," by R. A. Emerson.

"On a Back Cross Involving Three Allelomorphic Pairs in Mice," by J. A. Detlefsen.

"Congenital Variations in Guinea-pigs and their Bearing on Certain Genetical Problems," by L. J. Cole and H. L. Ibsen.

After luncheon opportunity was given to inspect the equipment of the station and of the Eugenics Record Office, the activities of which were explained by the members of the staff in their several fields of interest.

The officers of the society for 1917 are:

President—George H. Shull, Princeton University.

Vice-president—Leon J. Cole, University of Wisconsin.

Secretary—Bradley M. Davis, University of Pennsylvania (1917–19).

Treasurer—J. Arthur Harris, Carnegie Station for Experimental Evolution (1915–17).

Additional Members of the Executive Committee—David H. Tennent, Bryn Mawr College (1917); Henry V. Wilson, University of North Carolina (1915–17); Frank R. Lillie, University of Chicago (1916–18); Raymond Pearl, Maine Agricultural Experiment Station (1917–19).

Bradley M. Davis,
Secretary for 1916